DOCUMENT RESUME

ED 189 703 EA 012 833

AUTHOR Klenke, William H.; Barrows, Linda K.
TITLE The Measurement of Educational Change: The Application of the Level of Use (LoU) Approach.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Individualized Schooling.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
REPORT NO WRDCIS-TR-538
PUB DATE Mar 80
GRANT OB-NIE-G-80-0117
NOTE 83p.: Report from the Project on Studies of the Implementation of Individualized Schooling. Some figures and appendixes may be illegible due to small and broken print of original document. For a related document, see EA 012 832.

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Adoption (Ideas); *Educational Change; *Educational Innovation; Elementary Education; Longitudinal Studies; *Measurement Techniques; Questionnaires; *Research Methodology
IDENTIFIERS *Concerns Based Adoption Model; *Levels of Use Instrument

ABSTRACT

The purpose of this report is to describe attempts to measure change using the levels of use (LoU) approach and the difficulties encountered during its application in a research setting. The report has three parts. Part 1 focuses on a description of the LoU approach, including a description of the concerns-based adoption model (CBAM), the theoretical model on which the LoU is based. Part 2 details the procedures followed by the work group in applying the LoU and the difficulties encountered with the LoU. Part 3 briefly sketches an alternative approach to the LoU procedure for measuring the use of an innovation. Field experience in data collection quickly revealed that additional information besides that provided by the LoU was desirable. The LoU questionnaire was, therefore, supplemented with questions about the specific use of the innovation (complexity of use or innovation configuration). Subsequent data analysis suggested a third type of data: scope of use, the percent of instructional time or subject matter devoted to use of the innovation. Together the three measures provide a use profile the authors believe sufficient for documenting innovation use over time. (Author/IRT)

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Technical Report No. 538

THE MEASUREMENT OF EDUCATIONAL CHANGE: THE APPLICATION OF THE LEVEL OF USE (LoU) APPROACH

by

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Report from the Project on
Studies of the Implementation of Individualized Schooling

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March 1980

ED189703

EA 012 833

AUG 4 1980

Published by the Wisconsin Research and Development Center for Individualized Schooling. The project presented or reported herein was performed pursuant to a grant from the National Institute of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.

Center Grant No. OB-NIE-G-80-0117

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- conducting and synthesizing research to clarify the processes of school-age children's learning and development
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- developing and demonstrating improved instructional strategies, processes, and materials for students, teachers, and school administrators
- providing assistance to educators which helps transfer the outcomes of research and development to improved practice in local schools and teacher education institutions

The Wisconsin Research and Development Center is supported with funds from the National Institute of Education and the University of Wisconsin.

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Abstract

The Studies of Implementation Project was proposed as a 3-year longitudinal investigation of planned educational change. Specifically, the focus of the study was to explore the process by which an innovation is implemented and becomes a pattern of individualized schooling. The investigation was designed to identify those factors or conditions that promote or retard change and relate them to the modifications they foster.

Thirteen schools that were committed to the use of a specific innovation were selected for participation in the study. During the course of the investigation, the behaviors related to the use of the innovation were documented and analyzed. The behaviors were representative of the full range of the change process, i.e., adoption, implementation, and adaptation.

The innovation adopted for use in each of the 13 sites was the Instructional Programming Model (IPM), a component of the more comprehensive innovation known as Individually Guided Education (IGE). Ten sites in Wisconsin that were implementing the IPM as part of their program of IGE were selected for participation in the study. In order to allow for cross-urban analysis, three additional sites were selected from another state. Each of the additional urban sites was implementing Developing Mathematical Processes (DMP), a total mathematics program, designed around the IPM and developed at the Wisconsin Research and Development Center for Individualized Schooling.

Four questions guided the research project:

1. What factors affect the decision to adopt an innovation (the IPM)?

2. What factors affect the rate of implementation of an innovation (the IPM)?

3. What factors affect the adaptation of an innovation (the IPM)?

4. What factors affect the decision to abandon or replace the innovation (the IPM)?

The purpose of this report is to describe the work group's attempts to measure change using the LoU approach and the difficulties encountered during its application in a research setting. The report will be presented in three parts. Part I focuses on a description of the LoU approach including a description of the Concerns-Based Adoption Model (CBAM), the theoretical model on which the LoU is based. Part II details the procedures followed by the work group in applying the LoU and the difficulties encountered with the LoU in a research setting. Part III briefly sketches an alternative to the LoU procedure for measuring the use of an innovation.

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Wisconsin Research and Development Center for Individualized Schooling. [A detailed description of the sample selection procedures, the selected 13 sites, and the innovations (IGE , IPM, and DMP) can be found in Technical Report No. 494 (Davis, Klenke, & Barrows, 1979).]

The study was based on an extensive review of the change literature. The purpose of the literature review was to assess the current state-of-the-art. The following shortcomings were noted by Davis et al. (1979):

1. The design of most studies has been cross-sectional, despite the intrinsically dynamic nature of the phenomenon being investigated.

2. The emphasis of change studies has been predominantly directed toward precipitating change rather than studying it.

3. Most studies have focused exclusively upon the early or adoptive phase of the change process to the neglect of all later phases.

4. Most studies have been restricted to the direct user system, thereby assuring a closed-system analysis of a phenomenon most frequently described as being widely susceptible to influences from the external environment.

5. Most studies are primarily post-hoc in that their primary source of data has been the "after-the-fact" perceptions of users.

6. Most studies have been oriented toward documenting the fidelity of implementation (that is, the extent to which actual use corresponds to intended use) and thus, have avoided the more complex task of explaining how and why innovations are adapted (pp. 2-3).

In designing the study, the work group attempted to overcome the shortcomings of previous studies. To allow for the essentially dynamic nature of the change process, and to enable documentation of the process as it occurred, a longitudinal study was designed. An open-ended methodological stance which would allow for the flexibility to explore factors outside the user system and which would permit examination of adaptations in the innovation was deemed appropriate. A combination of qualitative and quantitative methods was selected.

Four questions guided the research project:

1. What factors affect the decision to adopt an innovation (the IPM)?

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4. What factors affect the decision to abandon or replace the innovation (the IPM)?

Selection of the Levels of Use Instrument

One task confronting the work group early in the design of the study was the identification of an instrument or a procedure to

"measure" change rather than merely document the precipitators of change. An instrument sensitive to changes in the use of an innovation was critical as a source of baseline and subsequent data and a necessary requisite for a study which was designed to relate adoption events to later implementation patterns.

The search for an appropriate means by which to measure the use of an innovation resulted in the selection of the Levels of Use (the LoU) instrument, a measure developed at the University of Texas R & D Center. According to current research literature, the LoU was a promising research tool by which to document changes in the use of an innovation (Hall, Loucks, Rutherford, & Newlove, 1975; Hall & Loucks, 1977). The developers of the LoU identified and defined eight levels of use of an innovation which are hypothesized to be sequentially related phases. Each of the eight phases is characterized by specific user behaviors which can be identified through a structured interview process. Once these behaviors are identified through the interview, a user can be labeled by a trained rater as being at one of the eight levels of use.

An invitation was extended to one of the developers of the LoU interview to become a member of the Studies of Implementation Advisory Committee. Following his acceptance, staff members were able to gain valuable firsthand information about the LoU approach. As a result of conversations with the LoU developer and the promising nature of the LoU literature, the work group decided to adopt the LoU approach as the research procedure for documenting change.

The Studies of Implementation staff planned and prepared for the use of the LoU approach in an orderly sequence. First, staff members were trained by the developers in the underlying theory of the instrument and in procedures for developing an interview protocol, for conducting interviews, and for rating interview data. The staff then developed the LoU protocol appropriate for the innovation under focus, the IPM. Next, staff members went into the schools and conducted the interviews. Finally, upon return from the field, staff members rated the tapes. As interview data were processed, staff members began to question its validity and completeness as certain research problems surfaced.

Purpose of this Report

The purpose of this report is to describe the work group's attempts to measure change using the LoU approach and the difficulties encountered during its application in a research setting. The report will be presented in three parts. Part I will focus on a description of the LoU approach including a description of the Concerns-Based Model (CBAM), the theoretical model on which the LoU is based. Part II will detail the procedures followed by the work group in applying to LoU and the difficulties encountered with the LoU in a research setting. Part III will briefly sketch an alternative to the LoU procedure for measuring the use of an innovation.

Definitions

Before proceeding with a description of the Concerns-Based Adoption Model and the LoU approach, the meanings of key terms used

in this paper will be defined. Cursory examination of the literature on planned educational change reveals that there is wide variation in the definitions of several terms. To avoid possible confusion, the definitions used by the Studies of Implementation work group are explicated below.

1. Change. We accept the definition of change suggested by Miles (1964): "[an] alteration in the goals, structure, or processes of a system" (p. 13). This definition allows change to take a variety of forms ranging from a relatively superficial alteration to a major reorientation in the value structure of a system. Further, the definition focuses on the institution, not on individuals.

2. Planned change. Limiting Miles's definition to include only purposive behavior, we define planned changed as a deliberate alteration in the goals, structure, or processes of a system.

3. Innovation. Miles's (1964) definition of innovation incorporates the three criteria which we consider to be essential in delineating the term: intention, uniqueness, and specificity. Thus, we have accepted his definition of innovation: "A deliberate, novel, specific change, which is thought to be more efficacious in accomplishing the goals of a system" (p. 14).

4. Adoption process. We define the adoption process as those activities which precede the actual use of an innovation. These activities may include problem awareness, innovation awareness, consideration of the merits of an innovation, the actual decision to use the innovation, and a trial period. The adoption process ends as the innovation is applied to the client group.

5. Implementation process. The implementation process begins when the innovation is actually put into effect. By our definition, implementation is synonymous with use.

6. Adaptation. Adaptation includes those activities that either modify the innovation to meet environmental conditions or modify the system to meet the requirements of the innovation. Adaptations may occur either during the adoption or the implementation process and are the result of the interaction between the system and the innovation.

7. The change process. The change process includes adoption, implementation, and adaptation and results in an alteration of the goals, structure, or processes of a system. The underlying dimension of this definition is time: "Whether or not an activity is an adoption or implementation event depends on when the activity occurs not necessarily on the nature of the activity. Adaptation may occur at any time in the change process" (Barrows, Klenke, & Heffernan, 1979).

PART I

THE CONCERNS-BASED ADOPTION MODEL AND THE LEVELS OF USE APPROACH

The Concerns-Based Adoption Model

The Concerns-Based Adoption Model (CBAM) is an eclectic model of change that incorporates features of three change perspectives described by Havelock (1971), the linkage, problem-solving, and research, development, and diffusion models. CBAM is similar to the RD&D model in two ways: (a) the primary emphasis of both models is the development of problem-solving capabilities by the users of the innovation, and (b) according to both models, an external change agent must be responsible for developing these problem-solving capabilities within the user system (Hall, Wallace, & Dossett, 1973). The CBAM framework assumes that an innovation is in fact going to be used. According to CBAM developers, "adoption" is defined as the

> multitude of activities, decisions, and evaluations that encompass the broad effort to successfully integrate the innovation into the functional structure of a formal organization such as a school, a college, or an industrial organization (Hall et al., 1973, p. 5; emphasis added).

It is important to note that the CBAM definition of adoption differs from the usual meaning of the term in the change literature. Generally, "adoption" is used to refer to those events or activities associated with the decision to use an innovation. The CBAM definition of

adoption roughly corresponds to the term "implementation" in the literature.

The CBAM evolved from the personal experiences of its developers and the conceptual work of Frances Fuller. Fuller (1969) researched the concerns of preservice and inservice teachers and posited a developmental sequence of concerns related to teaching. As interpreted by Hall et al. (1973):

> the concerns hypothesis states when an individual encounters a new situation that requires interaction with others, his behavior is initially governed by concerns about himself and the demands that the situation makes upon him. As these self-concerns become resolved, the individual moves to concerns focusing on the nature of the task and the ability of task performance. Ultimately, the individual becomes concerned about the impact he is making upon others and strives to optimize his efforts for others (p. 6).

While preliminary data suggested a developmental sequence of teacher concerns, Fuller exposed several important unresolved issues. First, the details of the developmental sequence could not be fully understood from the data. Since the hypothesized developmental sequence of concerns evolved from group-based data, Fuller wondered: (a) whether it was appropriate to assume that individual teachers progress through an identical sequence; (b) whether progression through the stages was mandatory, or could a stage be skipped; and (c) whether regression to the lower stages was possible and, if so,

what was the net result of regression? A second issue raised by Fuller related to generalizability. Fuller pondered the degree to which results could be generalized to other role groups, professors, administrators, and others in non-teaching situations. And third, the actual relationship of the stated concerns (if any) to teaching behavior, competency, or student learning was still unresolved.

Despite the unresolved issues raised by Fuller's work with teacher concerns, the developers of the CBAM (Hall et al., 1973), relying on their own personal experience, hypothesized that both the developmental nature and sequence of teacher concerns was generalizable to the innovation adoption process. Thus, the CBAM (Figure 1) was designed as consisting of two primary systems, the resource system and the user system, and a third temporary system, the collaborative adoption system. According to Hall et al. (1973), the existence of these three systems creates the structure through which "a series of hierarchically ordered decisions related to the sequential phases of the adoption process is possible" (p. 7).

The resource system (Figure 1) assumes a leadership role during the initial phases of the adoption process. This leadership role is founded on the belief that the resource system,

> has more knowledge about the innovation than the user, more experience with the innovation, and a repertoire of materials, strategies, and consultants and change agents who are both knowledgeable about the innovation and skilled in the change process (p. 7).

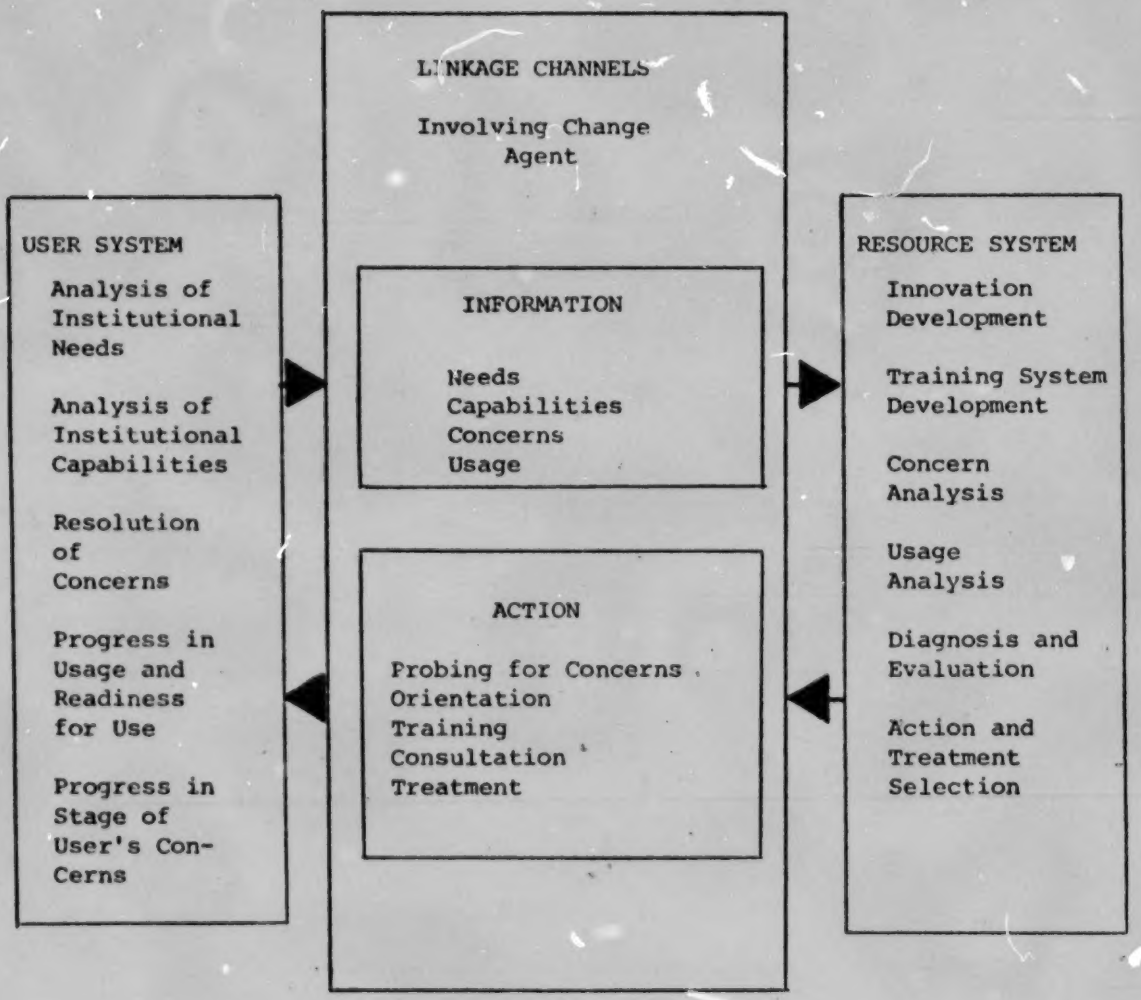

Figure 1. Conceptual structure and functional process organization of CBAM requirements.

Note. From "A developmental conceptualization of the adoption process within educational institutions" by G. E. Hall, R. C. Wallace, and W. F. Dossett, R & D Center for Teacher Education, University of Texas at Austin, September 1973, p. 37.

The primary goal of the resource system is to equip users with the necessary tools to become a problem-solving system and independent of the resource system. When user system independence has been achieved, the resource system assumes a less active role in the adoption process.

The user system is limited to those individuals who actually use the innovation. Several assumptions made by Hall et al. (1973) characterize the user group: They are acknowledgeable about the resources available to them; they are cognizant of their own specific needs; and they themselves have reached the decision to adopt the innovation as a possible solution to an identified problem.

The collaborative adoption system is the linkage channel connecting the user and resource systems. Formed through the efforts of the change agent, the collaborative system is the vehicle through which interactions between the two primary systems occur. Two general kinds of interactions between the systems are funneled through the collaboration adoption system--information and action. Information refers to the flow of "data on the user's needs, capabilities, concerns, and usage regarding the innovation" (pp. 10-11) from the user system through the linkage channel to the resource system. The resource system processes the information from the user system and develops appropriate responses. These responses are then translated into action by the change agent and communicated back to the user system. In addition to facilitating communication between the two permanent systems, the change agent also provides training and consultation to the users. The collaborative system--i.e., the linkage

channel--is temporary, and ceases to exist when the user system is able to carry on implementation independent of the resource system.

The establishment and maintenance of the linkage channel is the responsibility of the change agent and results from continual monitoring of (a) the user's state of readiness, and (b) the user's effective use of the innovation. The state of readiness is defined as "the overt manifestations of the initial checking-out process, the subsequent knowledge and skill needs, and the problems encountered in preparing for and actually using the innovation" (p. 14). Concerns, in the CBAM framework, refers to "the categorization of expressions stated by the user related to his use of the innovation" (p. 14). The categories of concerns and their developmental sequence are hypothesized to be similar to those proposed by Fuller, i.e., self-concerns, task concerns, and finally, concerns of impact upon others. The progression of concerns have been labeled and measured by an instrument called the "Stages of Concerns."

The CBAM assumes that an innovation will be used in different ways by different members within the user system. The different ways of use are "definable and observable" (p. 11). These differing uses of the innovation are categorized into a hierarchical scale called the "Levels of Use." Each level of use is identifiable by unique observable user behaviors.

Both the Stages of Concern and the Levels of Use dimensions can be identified for each user. As a user becomes adept in using an innovation, he or she progresses to higher levels of use and stages of concerns. Generally the user's Stages of Concern level is

slightly higher than the Levels of Use rating. Movement to the higher levels on both scales is deemed desirable and a task of the change agent is to foster this maturation in the user system.

Assessing the "Stages of Concern" about an innovation can be accomplished indirectly through the analysis of the "user's reported observations, requests, problems, and successes" (Hall et al., 1973, pp. 15-16). Assessment of the "Levels of Use" of the innovation was originally posited to be possible only through the "direct observation of it (use of the innovation) and a direct assessment of the user's knowledge" (Hall et al., 1973, p. 15). Subsequent work by the R & D Center for Teacher Education, University of Texas at Austin, has resulted in the assessment of the "Levels of Use" through a focused interview (Loucks, Newlove, & Hall, 1975). The focused "Levels of Use" interview was used by the Studies of Implementation work group.

The LoU Approach

The Levels of Use of an innovation, a concept which evolved from the Concerns-Based Adoption Model, is an attempt to describe the behavior of individual users of an innovation.

The behaviors of users are categorized into eight distinct levels of use (see Figure 2). The eight different levels are hypothesized to encompass the range of user behaviors and represent developmental growth. Movement from one level to the next level is characterized by a key decision point.

LEVELS OF USE

SCALE POINT DEFINITIONS OF THE LEVELS OF USE OF THE INNOVATION Levels of Use are distinct states that represent observably different types of behavior and patterns of innovation use as exhibited by individuals and groups. These levels characterize a user's development in acquiring new skills and varying use of the innovation. Each level encompasses a range of behaviors, but is defined by a set of identifiable Decision Points. For descriptive purposes, each level is defined by seven categories.	CATEGORIES KNOWLEDGE That which the user knows about characteristics of the innovation, how to use it, and consequences of its use. This is cognitive knowledge related to using the innovation, not feelings or attitudes.	 ACQUIRING INFORMATION Solicits information about the innovation in a variety of ways, including questioning resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.	 SHARING Discusses the innovation with others. Shares plans, ideas, resources, outcomes, and problems related to use of the innovation.
LEVEL 0 NON-USE. State in which the user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.	Knows nothing about this or similar innovations or has only very limited general knowledge of efforts to develop innovations in the area.	Takes little or no action to solicit information beyond reviewing descriptive information about this or similar innovations when it happens to come to personal attention.	Is not communicating with others about the innovation beyond possibly acknowledging that the innovation exists.
DECISION POINT A	*Takes action to learn more detailed information about the innovation.*		
LEVEL I ORIENTATION. State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demands upon user and user system.	Knows general information about the innovation such as origin, characteristics, and implementation requirements.	Seeks descriptive material about the innovation. Seeks opinions and knowledge of others through discussions, visits, or workshops.	Discusses the innovation in general terms and/or exchanges descriptive information, materials, or ideas about the innovation and possible implications of its use.
DECISION POINT B	*Makes a decision to use the innovation by establishing a time to begin.*		
LEVEL II PREPARATION. State in which the user is preparing for first use of the innovation.	Knows logistical requirements, necessary resources and timing for initial use of the innovation, and details of initial experiences for clients.	Seeks information and resources specifically related to preparation for use of the innovation in own setting.	Discusses resources needed for initial use of the innovation. Joins others in pre-use training and in planning for resources, logistics, schedules, etc., in preparation for first use.
DECISION POINT C	*Begins first use of the innovation.*		
LEVEL III MECHANICAL USE. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.	Knows on a day-to-day basis the requirements for using the innovation. Is more knowledgeable on short-term activities and effects than long-range activities and effects of use of the innovation.	Solicits management information about such things as logistics, scheduling techniques, and ideas for reducing amount of time and work required of user.	Discusses management and logistical issues related to use of the innovation. Resources and materials are shared for purposes of reducing management, flow and logistical problems related to use of the innovation.
DECISION POINT D-1	*A routine pattern of use is established.*		
LEVEL IV A ROUTINE. Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.	Knows both short- and long-term requirements for use and how to use the innovation with minimum effort or stress.	Makes no special efforts to seek information as a part of ongoing use of the innovation.	Describes current use of the innovation with little or no reference to ways of changing use.
DECISION POINT D-2	*Changes use of the innovation based on formal or informal evaluation in order to increase client outcomes.*		
LEVEL IV B REFINEMENT. State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.	Knows cognitive and affective effects of the innovation on clients and ways for increasing impact on clients.	Solicits information and materials that focus specifically on changing use of the innovation to affect client outcomes.	Discusses own methods of modifying use of the innovation to change client outcomes.
DECISION POINT E	*Initiates changes in use of innovation based on input of and in coordination with what colleagues are doing.*		
LEVEL V INTEGRATION. State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.	Knows how to coordinate own use of the innovation with colleagues to provide a collective impact on clients.	Solicits information and opinions for the purpose of collaborating with others in use of the innovation.	Discusses efforts to increase client impact through collaboration with others on personal use of the innovation.
DECISION POINT F	*Begins exploring alternatives to or major modifications of the innovation presently in use.*		
LEVEL VI RENEWAL. State in which the user re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.	Knows of alternatives that could be used to change or replace the present innovation that would improve the quality of outcomes of its use.	Seeks information and materials about other innovations as alternatives to the present innovation or for making major adaptations in the innovation.	Focuses discussions on identification of major alternatives or replacements for the current innovation.

Figure 2. LoU chart.

Note. Reprinted from "Levels of use of the innovation: A framework for analyzing innovation adoption" by G. E. Hall, S. F. Loucks, W. L. Rutherford, and B. W. Newlove, Journal of Teacher Education, 1975, 1,p..54.

CATEGORIES

ASSESSING	PLANNING	STATUS REPORTING	PERFORMING
Examines the potential or actual use of the innovation or some aspect of it. This can be a mental assessment or can involve actual collection and analysis of data.	Designs and outlines short- and/or long-range steps to be taken during process of innovation adoption, i.e., aligns resources, schedules activities, meets with others to organize and/or coordinate use of the innovation.	Describes personal stand at the present time in relation to use of the innovation.	Carries out the actions and activities entailed in operationalizing the innovation.
Takes no action to analyze the innovation, its characteristics, possible use, or consequences of use.	Schedules no time and specifies no steps for the study or use of the innovation.	Reports little or no personal involvement with the innovation.	Takes no discernible action toward learning about or using the innovation. The innovation and/or its accouterments are not present or in use.
Analyzes and compares materials, content, requirements for use, evaluation reports, potential outcomes, strengths and weaknesses for purpose of making a decision about use of the innovation.	Plans to gather necessary information and resources as needed to make a decision for or against use of the innovation.	Reports presently orienting self to what the innovation is and is not.	Explores the innovation and requirements for its use by talking to others about it, reviewing descriptive information and sample materials, attending orientation sessions, and observing others using it.
Analyzes detailed requirements and available resources for initial use of the innovation.	Identifies steps and procedures entailed in obtaining resources and organizing activities and events for initial use of the innovation.	Reports preparing self for initial use of the innovation.	Studies reference materials in depth, organizes resources and logistics, schedules and receives skill training in preparation for initial use.
Examines own use of the innovation with respect to problems of logistics, management, time, schedules, resources, and general reactions of clients.	Plans for organizing and managing resources, activities, and events related primarily to immediate ongoing use of the innovation. Planned-for changes address managerial or logistical issues with a short-term perspective.	Reports that logistics, time, management, resource organization, etc., are the focus of most personal efforts to use the innovation.	Manages innovation with varying degrees of efficiency. Often lacks anticipation of immediate consequences. The flow of actions of the user and clients is often disjointed, uneven and uncertain. When changes are made, they are primarily in response to logistical and organizational problems.
Limits evaluation activities to those administratively required with little attention paid to findings for the purpose of changing use.	Plans intermediate and long-range actions with little projected variation in how the innovation will be used. Planning focuses on routine use of resources, personnel, etc.	Reports that personal use of the innovation is going along satisfactorily with few if any problems.	Uses the innovation smoothly with minimal management problems; over time, there is little variation in pattern of use.
Assesses use of the innovation for the purpose of changing current practices to improve client outcomes.	Develops intermediate and long-range plans that anticipate possible and needed steps, resources, and events designed to enhance client outcomes.	Reports varying use of the innovation in order to change client outcomes.	Explores and experiments with alternative combinations of the innovation with existing practices to maximize client involvement and to optimize client outcomes.
Appraises collaborative use of the innovation in terms of client outcomes and strengths and weaknesses of the integrated effort.	Plans specific actions to coordinate own use of the innovation with others to achieve increased impact on clients.	Reports spending time and energy collaborating with others about integrating own use of the innovation.	Collaborates with others in use of the innovation as a means for expanding the innovation's impact on clients. Changes in use are made in coordination with others.
Analyzes advantages and disadvantages of major modifications or alternatives to the present innovation.	Plans activities that involve pursuit of alternatives to enhance or replace the innovation.	Reports considering major modifications of or alternatives to present use of the innovation.	Explores other innovations that could be used in combination with or in place of the present innovation in an attempt to develop more effective means of achieving client outcomes.

Figure 2 (continued)

> Before actual use, the individual becomes oriented to and increasingly knowledgeable about the innovation. First use is typically disjointed with management problems quite common. With continued use, management becomes routine and the teacher is able to spend more effort providing effective instruction for the learners and in integrating what she/he is doing with what other teachers are doing. What the teacher does as she/he matures in use of an innovation can be described behaviorally. . .(Loucks & Hall, 1977, pp. 19-20).

Implicit in the phases "as she/he matures (emphasis added) in use of innovation. . ." and "the teacher is able to spend more effort providing effective instruction" (as he or she moves through eight levels) is the additional assumption that a higher level of use rating indicates a higher quality of innovation use.

Figure 2 describes the scale point definitions of each of the eight Levels of Use. Further, it illustrates that seven categories of behaviors (e.g., knowledge, acquiring information, etc.) contribute to each of the eight overall levels. It also delineates the decision points which separate the various levels. The relationship between the eight levels, the seven decision points, and the seven categories is best summarized by Hall et al. (1975):

> Levels of Use are distinct states that represent observably different types of behavior and patterns of innovation use as exhibited by individuals and groups. These levels characterize a user's development in acquiring new skills and varying use of the innovation. Each level

> encompasses a range of behaviors, but is limited by a set of identifiable Decision Points. For descriptive purposes, each level is defined by seven categories (p. 54).

The three essential ingredients of the level of use--the eight Levels of Use, the seven decision points, and the seven categories of user behaviors--were used as the basis for the development of the LoU interview (Loucks, Newlove, & Hall, 1975, p. 21).

The LoU Interview Protocol

The purpose of the LoU interview is to gather a sufficient amount of data from individuals using an innovation in order to assign a level of use for each user (Loucks et al., 1975). Two independent, but related, approaches are suggested as the focus of designing the protocol: (a) to structure the protocol around the seven Decision Points; and (b) to construct the protocol to probe each of the seven categories (Loucks et al., 1975). Either of the two approaches or a combination of both may be used in the design of the protocol.

Procedurally, the interview begins with questions focused on user behaviors relevant to the key decision points. The questioning follows a branching format (Figure 3). Questions may also be included to probe the seven behavior categories. Decision and behavior questions support each other and contribute to the assignment of an LoU rating.

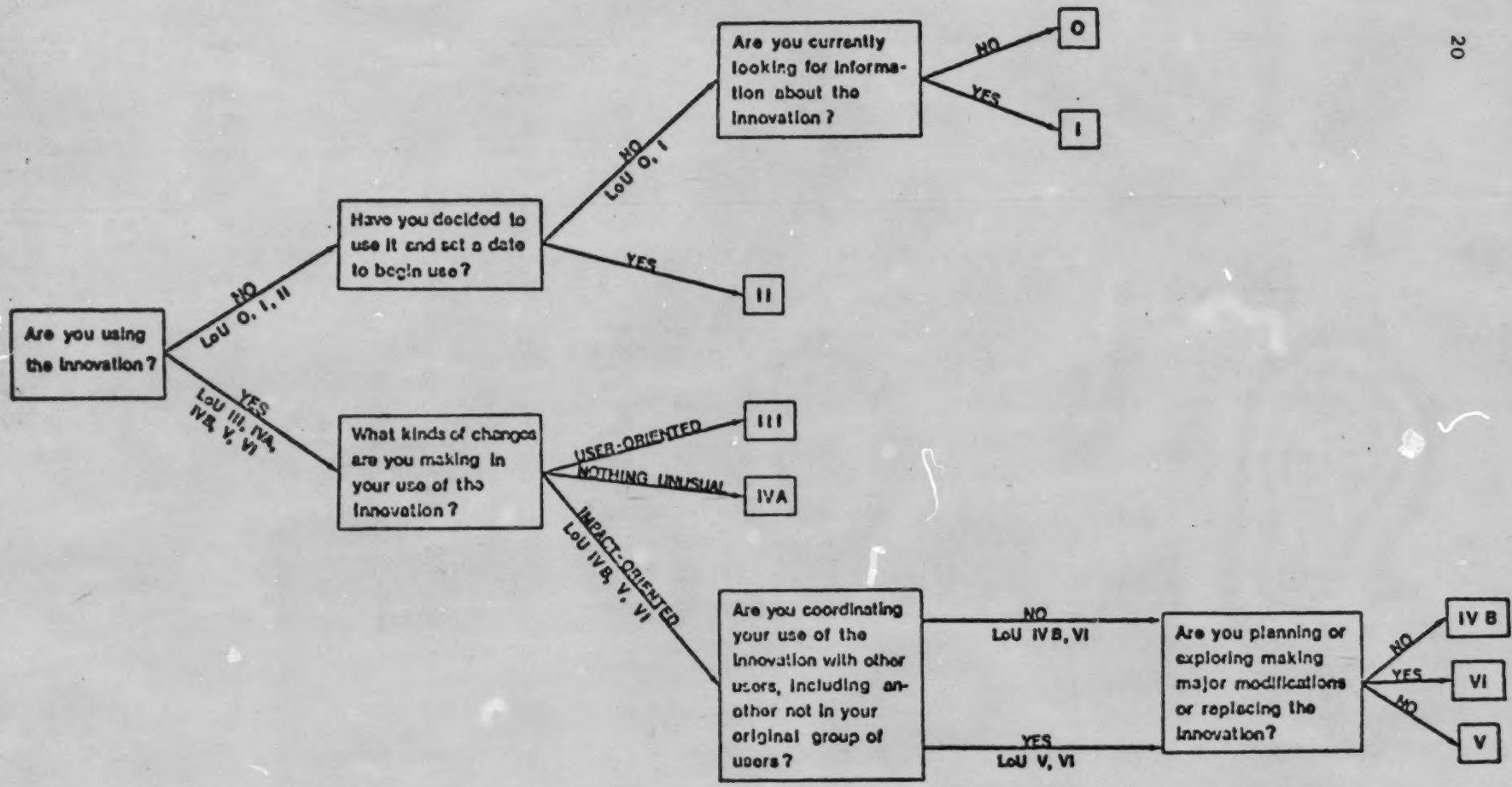

Figure 3. Overview of branching format of the LoU interview.

Note. From Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters by S. F. Loucks, B. W. Newlove, and G. E. Hall, Austin, Texas: The Research and Development Center for Teacher Education, 1975.

Once a general approach to the LoU protocol has been made, the next task was to select the criteria which would designate use of the innovation. It was recommended by the LoU developers that specific criteria for use be established prior to conducting the LoU interviews (Loucks et al., 1975, p. 31). Prior establishment of the criteria allows for use/nonuse decisions to be made quickly and consistently during a series of interviews. Without a prior list of use criteria, use/nonuse decisions might be contaminated by interviewer bias, subjectivity, or inconsistency.

Establishing the use criteria prior to conducting the interviews leads to the assumption that "use" requires strict fidelity to the developer's "ideal" conceptualization of the innovation. The assumption of strict fidelity excludes individuals who have made adaptations in the use criteria either prior to or during actual use of the innovation. Assuming the fidelity perspective means that such adapters must be rated as nonusers or possibly as past users (Levels 0-II).

Hall and Loucks (1978) recognized that strict fidelity to the developers ideal does not always occur in reality. They observed that innovations were operationalized in drastically different ways in different field sites (Hall & Loucks, 1978, p. 9). Their observation of the diversity in operationalization of an innovation led to the development of the concept of innovation configuration.

> An innovation is not used in a single operational form. Rather, when an innovation is implemented, there are likely to be different forms of adaptations of the innovation. . . . As a result, as the innovation is

> observed across classrooms, different patterns or configurations may be found. . . . For each innovation key characteristics or components can be identified for which variations in the innovation can be observed. . . . Innovation configurations are the operational patterns of the innovation that result from selection and use of different innovation component variations (Hall & Loucks, 1978, pp. 9-10).

Hall and Loucks suggested a 5-step process for determining configurations (see Figure 4). The process begins with identifying the essential components of the innovation and proceeds through the development of a checklist which lists the possible variations within each component and concludes with the identification of dominant configurations based on responses on the checklist.

Like the use criteria, the configuration patterns are determined before any large scale LoU interviewing is undertaken. The process, as outlined in Figure 4, begins with nonusers (i.e., developers and facilitators) nominating the essential components of the innovation and the varying forms the essential components may take. Users participate minimally at Step 2 after the key components have already been identified.

In general, both the use/nonuse and configuration questions evolve from the fidelity orientation. Interviewees are categorized according to their use/nonuse of the components and the form of each component if in use. This fidelity orientation creates an interpretation dilemma. Several users may be placed together in one of the eight

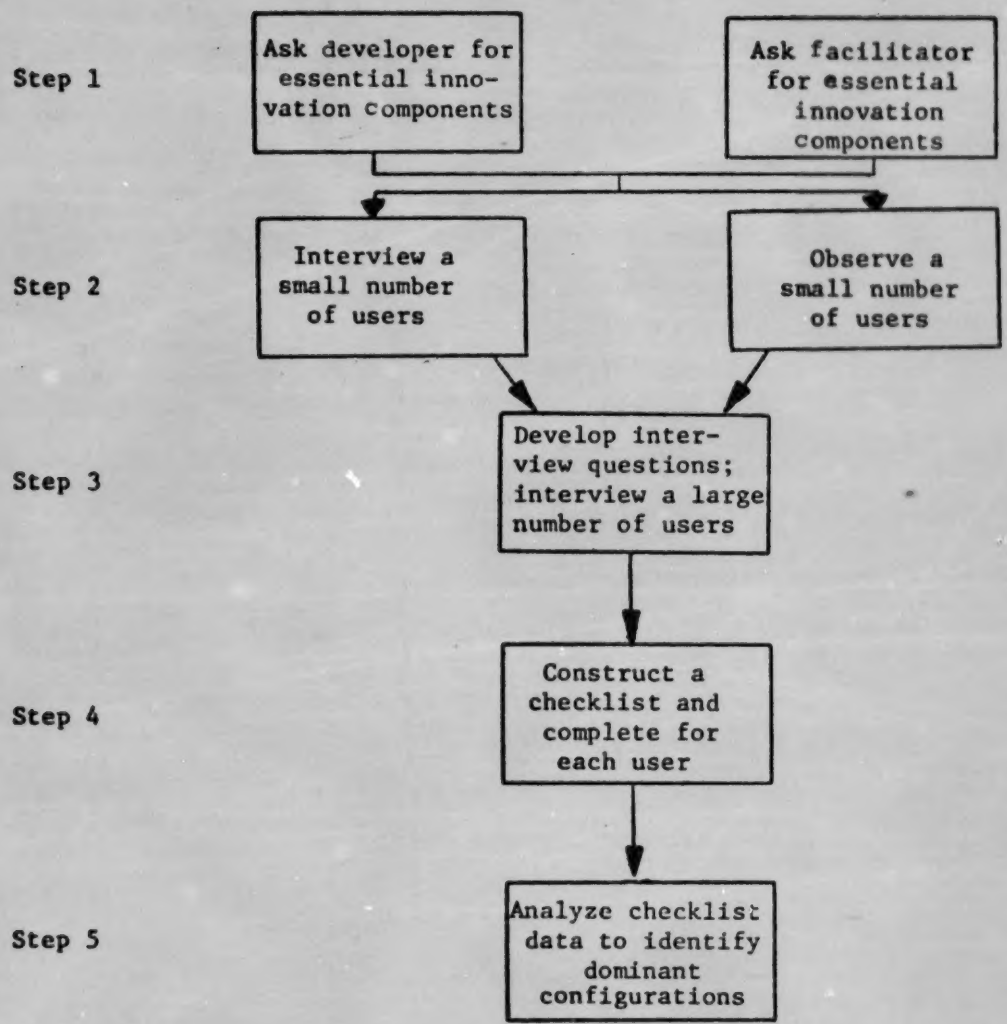
Step 1
Ask developer for essential innovation components
Ask facilitator for essential innovation components
Step 2
Interview a small number of users
Observe a small number of users
Step 3
Develop interview questions; interview a large number of users
Step 4
Construct a checklist and complete for each user
Step 5
Analyze checklist data to identify dominant configurations

Figure 4. A procedure for identifying configurations.

Note. From Innovation configurations: Analyzing the adaptations of innovations, by G. E. Hall and S. F. Loucks, a paper presented at the annual meeting of the AERA, Toronto, Canada, 1978.

levels of use of the innovation although their use of the innovation--i.e., their innovation configurations--may be very different. For example, several users may be all rated at Level III (Mechanical Use) but each may be implementing the innovation in a different form. The similar ratings for varying uses creates interpretative problems.

Another consideration in the design of the LoU interview protocol is the complexity of the innovation iteself. Many innovations, such as IGE, are composed of several unique or interrelated "smaller" innovations. If the innovation under study contains several "bundles of innovations" it is recommended that the interview protocol be constructed to gather data on the use of each of the separate innovations comprising the larger innovation (Loucks et al., 1975, p. 32). This procedure, depending on the number and extensiveness of the separate innovations, may require more than one LoU interview. LoU ratings are subsequently made for each user's use of each of the separate innovations.

Conducting the LoU Interview

Standard interview procedures are recommended in conducting the LoU interview. Each interview should be tape recorded. According to reports from experienced interviewers, few individuals do not permit taping. In cases where taping is not allowed, extensive notes are to be taken by the interviewer.

The LoU interview protocol forms the basis of the interview. Focused questions are used as the stimuli for data collection. While

the questions should be carefully adhered to, interviewers are permitted the flexibility to extend and probe responses. Loucks et al. (1975) stress that the interviewer keep the questions focused on what the user is doing with the innovation at the present time. If the user reports that changes in the use of the innovation are being made presently or anticipated, the interviewer was reminded: "When probing for information about change, four questions should be kept in mind: (a) why, (b) what, (c) when, and (d) what plans"(Loucks et al., 1975, p. 35).

Rating the LoU Interview

For the data from each of the taped interviews, an LoU Rating Sheet (Figure 5) is used to code the data in each of the seven categories. Using the rating sheet, eight LoU ratings are possible,one for each of the seven categories and one overall LoU level. The suggested procedure to complete the rating is as follows:

> When the interviewee makes a statement that appears to place him/her at an LoU for a particular category, a tally mark is made on the rating sheet next to the appropriate number. Sometimes statements can be interpreted to apply to more than one category and tally marks should be made for each. After the interview is completed, the rater must make a decision for each category. This decision should not be based solely on which LoU has the most tally marks, since one statement may have significantly more

Tape #: Site: Interviewer:
Date: / / I.D. #: Rater:

Level	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall Lo
Non-Use D.P. A	0	0	0	0	0	0	0	0
Orientation D.P. B	I	I	I	I	I	I	I	I
Preparation D.P. C	II	II	II	II	II	II	II	II
Mechanical Use D.P. D-1	III	III	III	III	III	III	III	III
Routine D.P. D-2	IVA	IVA	IVA	IVA	IVA	IVA	IVA	IVA
Refinement D.P. E	IVB	IVB	IVB	IVB	IVB	IVB	IVB	IVB
Integration D.P. F	V	V	V	V	V	V	V	V
Renewal	VI	VI	VI	VI	VI	VI	VI	VI
User is not doing:	ND	ND	ND	ND	ND	ND	ND	ND
No information in interview:	NI	NI	NI	NI	NI	NI	NI	NI

Past User _____ Estimated past LoU _____

The amount of information in the interview was:	insufficient for rating	1	2	3	4	5	6	7 very adequate for rating
The interviewee:	does not fit on the chart	1	2	3	4	5	6	7 fits well on the chart
The interviewee:	was very difficult to interview	1	2	3	4	5	6	7 was no proble to interview

Figure 5. Level of use rating sheet.

Note. From LoU Training Session, Austin, Texas, 1978.

> meaning than all the others combined. However, the tally marks help provide evidence for a decision, particularly in cases that are not clearly one LoU or another (Loucks et al., 1975, p. 41).

It is suggested by developers that each category be rated independently since an individual could have different LoU levels for each of the categories. The LoU levels for each category are not to be made by any summing or mechanical procedure. Rather, the information coded in each category on the rating sheet and the rater's impressions of what the user is doing with the innovation with respect to the various categories form a "gestalt," which yields an LoU rating in each category.

To assist in the determination of the overall LoU, the rater is provided a series of guide sheets for each level. The guide sheet contains a definition of the level, the Decision Point signaling the possible entry into the level, and a description of the typical user behaviors for that level (see Figure 2). As in rating each of the seven categories, the rating procedure for determining the overall LoU level is based on a "gestalt"--a combination of marks on the rating sheet and the impressions of the rater about the user's application of the innovation.

These three tasks, developing the LoU interview protocol, conducting the LoU interview, and rating the taped interviews, constitute the LoU approach. The preceeding discussion briefly described procedures for accomplishing each of the tasks as suggested by the developers. A more detailed description of each of the tasks may be found in Loucks et al. (1975).

PART II

PROCEDURES AND PROBLEMS OF APPLYING THE LoU

IN A RESEARCH SETTING

Procedures

The Studies of Implementation staff planned and prepared for the use of the LoU in an orderly sequence. First, staff members were trained by the developers in the underlying theory of the instrument and in procedures for developing an interview protocol, for conducting interviews, and for rating interview data. The staff then developed the LoU protocol appropriate for the innovation under focus, the IPM. Next, staff members went into the schools and conducted the interviews. Finally, upon return from the field, staff members rated the tapes. As interview data were collected and processed, staff members began to question the completeness of the data as certain research problems surfaced. This part of the paper will deal with the work group's procedures for use of the LoU, and the next section will deal with some of the problems of use.

Preparation for Use of the LoU

The purpose of preparation activities was to help staff members become knowledgeable about the underlying theory of the LoU and about the application of the LoU procedure in a research setting. The initial preparation activities took two forms: Phase 1 consisted of a series of meetings with LoU developers at the Wisconsin Research

and Development Center, and Phase 2 consisted of attendance by three staff members at a formal training program at the Texas Research and Development Center. The first phase was designed to give all staff members an orientation to the use of the LoU and the development of the skills necessary to use the LoU interview. Meeting topics included an overview of the Concerns-Based Adoption Model (the theoretical basis of the LoU), the development of the LoU interview protocol, interviewer strategies, and LoU rating procedures. During these meetings, theoretical and technical aspects of the LoU were emphasized equally.

While most of the questions posed by staff members at these meetings were answered sufficiently, several areas of concern were left unresolved. However, these concerns did not seem to warrant abandonment of the use of the LoU approach. One concern was the "gestalt" nature of the rating procedure. Would the "general impressions" of the individual raters agree consistently? Another concern was the process by which the reliability of the rating process was established. Despite staff concerns about these two issues, the decision was made to explore the LoU approach further.

Phase 2 of staff preparation consisted of sending three staff members to the CBAM training program in Austin, Texas. The purpose of sending staff members to a formal LoU training program at the University of Texas was twofold: (a) to obtain sufficient training in order to achieve recognition for project staff as certified LoU interviewers and raters, and (b) to obtain additional information to solve several practical problems which were confronting the work

group as they prepared for use of the LoU. As a result of the training program, three staff members became certified LoU interviewers and raters.

CBAM staff people were extremely helpful in trying to resolve the questions of the work group members, but some problems remained unsolved. The first question related to the use of the seven behavior categories in rating the tapes. CBAM trainers indicated that the categories were not empirically derived. Rather, they were based on the experience of staff members at the Texas R & D Center. Trainers further indicated that the categories are not meant to be the only possible breakdown of user behaviors. Rather, their utility lay in the information they generate about an individual's use of an innovation. The categories, in effect, help the rater form a "gestalt" of the user's level of use. Trainers also emphasized that the overall LoU was more than just a summation of the individual tallies in each of the seven categories. Each tally was not of equal weight, according to the CBAM staff; raters had to assess the relative importance of each of the tallies in gaining a "feel" for the user's level of use.

A second unresolved issue concerned the relationships between the eight levels. CBAM staffers indicated that the levels should be treated as interval data, i.e., the difference between Level I, Orientation, and Level II, Preparation, should be considered equal to the difference between Level IV-A, Routine, and Level V, Refinement. Logically, the intervals did not seem equal to our staff because the higher levels (IV-A through VI) were not incremental steps. That is, while a non-user normally progresses from Levels 0 to I to II in a sequential fashion, IV-A users may progress to IV-B or V or VI in any

order. It was the judgment of our staff that the levels should be treated as nominal data rather than interval data.

A third question related to the unit of analysis for the study. According to the written statements of the developers, the LoU instrument "requires that the individual be a unit of analysis and the basic unit for data collection" (Hall, 1977, p. 4). However, at the LoU training session, Studies of Implementation researchers were informed that because of the nature of the IPM, the unit of analysis could be a group of individuals. LoU interviews could be conducted individually and data aggregated subsequently.

Having been exposed to the theoretical framework of the LoU, three major tasks had to be performed by the work group in order to apply the LoU interview in a research setting:

1. an LoU interview protocol had to be developed;
2. LoU interviews had to be conducted; and
3. each interview had to be rated in order to determine the correct Level of Use.

Design of the Interview Protocol

The design of the interview protocol necessitated the completion of two tasks: the formulation of questions, and the definition of the essential criteria of the innovation. Upon the recommendation of the CBAM staff, the questions contained in the most recent LoU prototype were adopted for use in our study (see Appendix A).

Assistance was sought from the Wisconsin Survey Laboratory in developing the format for the questionnaire.

Once the general questions for the interview had been established, the next task was to select the criteria which would designate use of the innovation. It was recommended by the LoU developers that specific criteria for use be established prior to conducting the LoU interviews (Loucks et al., 1975, p. 31). Prior establishment of the criteria allows for use/nonuse decisions to be made quickly and consistently during a series of interviews. Without a prior list of use criteria, use/nonuse decisions might be contaminated by interviewer bias, subjectivity,or inconsistency.

After many consultations with developers, implementors, and users of the innovation and an examination of the IGE literature, five use criteria of the IPM were identified. The five use criteria correspond to the steps of the IPM (see Figure 6) as outlined by Klausmeier, Quilling, Sorenson, Way, and Glasrud (1971) were: objective-based instruction (Steps 1, 2, 4); criteria-references preassessment (Step 3); student grouping based on individual needs (Step 5); criteria-referenced postassessment (Step 6); and regrouping based on individual needs (Step 7). Preliminary data from field observations suggested that the use of these five components varied greatly among teachers. As a result, a rule governing the designation of a user of the innovation was postulated: A user of the IPM was an individual using at least four of the five essential criteria of the IPM, one of which had to be the third component, student grouping based on individual needs. Those using fewer than four of the criteria or not using criteria three were designated nonusers.

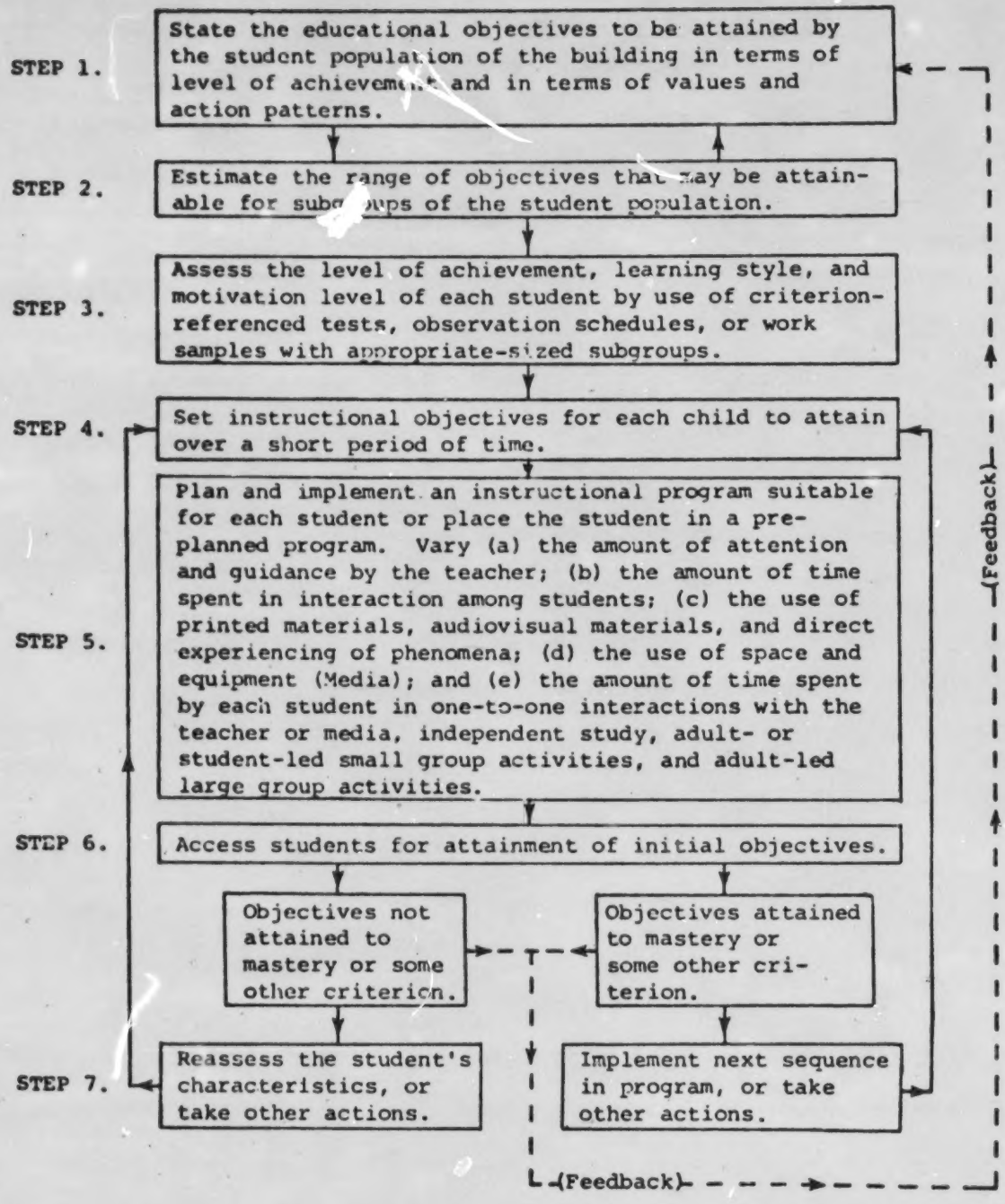
STEP 1.
State the educational objectives to be attained by the student population of the building in terms of level of achievement and in terms of values and action patterns.
STEP 2.
Estimate the range of objectives that may be attainable for subgroups of the student population.
STEP 3.
Assess the level of achievement, learning style, and motivation level of each student by use of criterion-referenced tests, observation schedules, or work samples with appropriate-sized subgroups.
STEP 4.
Set instructional objectives for each child to attain over a short period of time.
STEP 5.
Plan and implement an instructional program suitable for each student or place the student in a pre-planned program. Vary (a) the amount of attention and guidance by the teacher; (b) the amount of time spent in interaction among students; (c) the use of printed materials, audiovisual materials, and direct experiencing of phenomena; (d) the use of space and equipment (Media); and (e) the amount of time spent by each student in one-to-one interactions with the teacher or media, independent study, adult- or student-led small group activities, and adult-led large group activities.
STEP 6.
Access students for attainment of initial objectives.
Objectives not attained to mastery or some other criterion.
Objectives attained to mastery or some other criterion.
STEP 7.
Reassess the student's characteristics, or take other actions.
Implement next sequence in program, or take other actions.
(Feedback)
(Feedback)

Figure 6. Instructional programming model in IGE.

Note. Adapted from H. J. Klausmeier, M. R. Quilling, J. S. Sorenson, R. S. Way, and G. R. Glasrud, Individually guided education and the multiunit school: Guidelines for implementation. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1971.

Having defined the criteria for use, having adopted the interview questions, and having established the questionnaire format, the staff of the Studies of Implementation was ready to enter the field to conduct interviews. Appendix B contains the interview protocol used in the initial interviews.

Conducting the LoU Interviews

Standard interview procedures were used in conducting the LoU interviews. Each interview was taped and the interview protocol formed the basis for data collection. While the focused questions on the protocol allowed the interviewers the flexibility to probe particular responses, the trained interviewers were instructed during LoU interview training to adhere closely to the protocol provided (CBAM workshop, 1978). In keeping with the advice of LoU developers, interviewers were further instructed to focus on what the user was doing with the innovation at the present time.

Based on the recommendations of LoU developers, the work group decided to conduct LoU interviews twice during each school year: once near the beginning of the school year and once mid-second semester. While this interview timetable could be adhered to in the Wisconsin sites, an alteration was necessary in the non-Wisconsin sites. Materials for Developing Mathematical Processes (DMP), a curricular expression of the IPM, were not received in time for September use so the first LoU interviews were postponed until January and the second interview until May in the non-Wisconsin sites.

The unit of analysis for the IPM in the Wisconsin sites was the Instructional and Research (I & R) unit which consisted of three to six teachers planning and teaching cooperatively. One I & R unit was selected at each of the ten schools using a combination of random and purposive sampling, and interviews with all the teachers in each of these units were scheduled. Since the I & R units were implementing the IPM in both reading and math, half of the teachers in each of the units were asked about their use of the IPM in math and half were asked about their use of the IPM in reading. In the non-Wisconsin sites, I & R units did not exist; therefore, interviews were arranged with all the teachers in the school who were identified by the principal and math resource teacher as DMP users.

In the fall of 1978, three trained interviewers, who had already made several observations of classroom instruction in the schools, began conducting LoU interviews in the Wisconsin sites using the interview protocol in Appendix B. During these initial interviews it became strikingly apparent to the interviewers that the data obtained through the LoU interview were inconsistent with data from classroom observations. The LoU data did not seem to reflect the different ways in which the IPM was being used in the various sites. Thus, the LoU interview protocol was expanded to allow for the collection of additional information necessary for understanding the pattern of use of the IPM (see Appendix C).

Having revised the LoU interview for the final time, the staff collected data in all 13 sites. In the 10 Wisconsin sites, 52 teachers were each interviewed twice during the 1978-79 school year.

In the 3 non-Wisconsin schools, 38 teachers were interviewed in January and 36 teachers in May. The same interview protocol was used in all sites.

Rating the LoU Tapes

The Studies of Implementation work group used the rating procedure prescribed by the developers of the LoU (Loucks et al., 1975). Two trained raters separately listened to each taped LoU interview and, on the basis of the interviewee's responses to questions which probed the seven categories and the key decision points, an overall LoU was assigned. If the two ratings were discrepant, a third trained staff member rated the tape. Though the same trained work group members performed both interviewing and rating functions, no members rated interviews that they had conducted themselves. There was little difficulty in obtaining consensus on the tapes. As Tables 1 and 2 indicate, there was considerable agreement among the raters. The vast majority of the tapes were rated identically by two raters; only about 13% of the Wisconsin tapes and 18% of the non-Wisconsin tapes required a third rater; fewer than 3% had to be listened to by four raters. Although inter-rater reliability was high, the research staff began to question the meaning of the LoU ratings. The problems which the staff encountered in trying to make sense out of the data are detailed in the next section.

Problems

We encountered three major problems in applying the LoU instrument in a research setting. The first problem arose because there was

Table 1

Agreement Among Raters of the LoU Tapes in the Ten Wisconsin Sites by Administration

	Agreement by two raters	Agreement by three raters	Agreement by four raters	Total tapes rated	Tapes with insufficient information for rating	Interviews conducted
Administration 1 (Fall 1978)	33 (75%)[a]	9 (20%)	2 (5%)	44	8	52
Administration 2 (Spring 1979)	44 (92%)	4 (8%)	0 (0%)	48	4	52
Total	77 (84%)	13 (14%)	2 (2%)	92	12	104

[a]Numbers in parentheses indicate percent of total tapes rated in that administration.

Table 2

Agreement Among Raters of the LoU Tapes in the Three Non-Wisconsin Sites by Administration

	Agreement by two raters	Agreement by three raters	Agreement by four raters	Total tapes rated	Tapes with insufficient information for rating	Interviews conducted
Administration 1	24 (67%)[a]	12 (33%)	0 (0%)	36	2	38
Administration 2	33 (92%)	1 (3%)	2 (5%)	36	0	36
Total	57 (79%)	13 (18%)	2 (3%)	72	2	74

[a]Numbers in parentheses indicate percent of total tapes rated in that administration.

little variation among the several teachers across the sites with respect to their LoU ratings. Was the instrument insensitive to differences or was use of the innovation as homogeneous as the ratings suggested? The second issue evolved from the discrepancy between observed use of the IPM and the LoU data. Was the instrument valid, i.e., did it actually measure the level of use of the innovation or did it document some other phenomenon? The third problem was related to combining the data of the individual teachers into an overall LoU rating for their teaching unit. How could LoU ratings be aggregated meaningfully?

Little Variation in the Ratings

Within the first two days of interviewing, it was obvious that the data from the LoU interview were going to produce little variation across sites. Although the first day of interviewing took place in a school which had very recently begun implementation of the IPM and the second day of interviews took place in a school which had been implementing for more than seven years, almost all the teachers in both sites were rated at a IV-A level (Routine Use). This early tendency for most of the LoU ratings to cluster at the IV-A level continued throughout the entire year of data collection. As Table 3 indicates, more than three-fourths of the teachers in the Wisconsin sites were rated IV-A overall. In the non-Wisconsin sites, about two-thirds of the teachers achieved a IV-A rating. Note that approximately one fifth of the teachers in the non-Wisconsin sites received nonuser ratings largely because many of the DMP materials never arrived at all during the school year (see Table 4). Taking this into

Table 3

Distributions of Ratings for Levels of Use of the Innovation Interview in the Ten Wisconsin Sites

	Administration 1		Administration 2		Total	
LoU	Number	Percent	Number	Percent	Number	Percent
0	0	0	0	0	0	0
I	0	0	0	0	0	0
II	2	4	0	0	2	2
III	3	6	1	2	4	4
IV-A	35	67	43	82	78	75
IV-B	4	8	4	8	8	8
V	0	0	0	0	0	0
VI	0	0	0	0	0	0
Insufficient information to rate	8	15	4	8	12	11
Total	52	100	52	100	104	100

Table 4

Distributions of Ratings for Levels of Use of the Innovation Interview in the Three Non-Wisconsin Sites

	Administration 1		Administration 2		Total	
LoU	Number	Percent	Number	Percent	Number	Percent
0	4	11	1	3	5	7
I	3	8	0	0	3	4
II	1	3	7	19	8	11
III	3	8	1	3	4	5
IV-A	21	57	26	72	47	65
IV-B	3	8	1	3	4	5
V	0	0	0	0	0	0
VI	0	0	0	0	0	0
Insufficient information to rate	2	5	0	0	2	3
Total	38	100	36	100	74	100

account, the proportion of users of the innovation at the IV-A level is even more striking--about 82% overall.

The lack of variation in the ratings called into question the utility of the LoU instrument for our research purposes. We intended to use the LoU instrument as a measure of the level of use of the innovation; changes in the level of use were to be correlated with quantitative and qualitative data collected on key factors reported to affect the change process. If little variation in level of use was noted, the relationship between the factors could not be examined (see Felker, 1979).

The lack of variation in LoU was curious for two reasons. First, according to the CBAM, progression through the LoU is developmental and experienced users would be expected to be at different levels of use than more recent adopters. Yet, the sites in our study, randomly selected from an age stratum and representing the whole range from new adopters to seasoned users, produced little variation in LoU ratings. Second, the lack of variation in rating was curious because interviewers had also been frequent observers in the classrooms of the various schools. As bimonthly visitors to the classrooms, the interviewers/observers had noted wide variation in the use of the IPM and were puzzled by the homogeneity of the ratings. Why were these obvious differences in implementation not reflected in the LoU ratings?

The Appropriateness of the Term "Levels of Use"

A careful examination of the LoU interview protocol provides a possible answer to the lack of variation in ratings. The LoU inter-

view points only cursory attention to the specific way in which an innovation is being used. The use criteria--the critical components which determine use--are established prior to the interview and interviewers are instructed to inquire only whether or not each of the criteria is currently being used. If the criteria are reported to be in use, the decision is made that the teacher is indeed a user of the innovation and the interviewer proceeds to questions about knowledge of the innovation, collaboration with other users, etc. Interviewers are not directed to probe for specifics about the way in which each of the criteria is used.

In reality, there may be considerable variation in the particular use of the critical components of an innovation. For example, one criteria of the IPM is the use of preassessment. In some classrooms, preassessment might take the form of a criterion-referenced test while in another classroom it might be an inventory of student interests. Or, as another sample criteria, student grouping may mean placement of children into a homeroom at the beginning of the school year to one teacher and frequent regrouping of students based on performance measures to another teacher. In both classrooms, preassessment and grouping are used, yet the ways in which each is used vary considerably. The LoU interview was originally designed did not collect data on these varying uses. Rather the LoU instrument seemed to assume that if teachers were doing anything at all with respect to the critical components, they were doing the same thing.

As mentioned earlier, Hall and Loucks (1978) acknowledge that an innovation may be implemented in a variety of forms. Thus they

developed the concept of innovation configurations and devised a 5-stage process for identifying configurations. The identification of configurations was presented as a supplementary optional activity by the developers: Use of the LoU instrument and subsequent assignment of LoU ratings did not require acknowledgement or data collection about innovation configurations.

After two days of interviewing, the Studies of Implementation work group realized that either the innovation configuration or the complexity of use (i.e., the way in which the innovation was being used with respect to the use-criteria) had to be documented longitudinally. In order to understand the process by which adaptations are made in an innovation and the factors which influence the adaptations, information on complexity of use was essential. Thus we supplemented the LoU interview (see Appendix C). Questions which probed the specific ways in which users implemented each of the various criteria were added. We believed that by supplementing the existing questions we were able to collect more complete data about the actual use of the innovation. We assumed this additional data would allow us to document more fully changes in the pattern of use of the innovation over time. Our initial procedure for establishing complexity of use differed from Hall and Loucks's suggested procedure for determining innovation configurations in the following ways:

1. Instead of establishing a priori categories of component variations, we allowed users to describe their instructional program with only the most open-ended and general prompting provided.

2. We incorporated this general discussion of innovation use into the LoU interview. While this procedure lengthened the interview somewhat, it allowed us to probe responses immediately, an option generally not available with a paper-and-pencil checklist.

3. No attempt was made to identify "dominant configurations." Rather, narratives of the instructional programs of each of the I & R units were written and validated through feedback sessions with staff teachers. The component variations were noted for future use in the development of a complexity instrument.

Our examination of the LoU as suggested by its developers led us to conclude that the LoU instrument more correctly documents how well users report they are managing the innovation than their actual pattern of use of an innovation. While it may seem to be a semantic question, "level of use" appears to us to be a misnomer for the phenomena described by the LoU rating. Rather, to use the LoU rating reflects the management level of an innovation at some unspecified use level. When viewed as a management rating, the lack of variation in ratings is not surprising. Level IV-A, around which most of the ratings clustered, is the level termed Routine Use: "Use of the innovation is stabilized. Few, if any, changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences" (Hall et al., 1975, p. 54). It is reasonable to expect that most individuals will adapt an innovation--i.e., alter their use of the essential criteria--in order to make the innovation manageable. Few, if any, teachers would tolerate an innovation which required them to be in a constant state of disequilibrium for an extended period of time. Logically, one would expect a preponderance of IV-A ratings.

However, the Level of Use IV-A rating yielded insufficient information for our research purposes: While it is an indication that few changes were being made and that the innovation was being managed routinely, it told nothing of what changes in the use criteria had been made and for what reasons. The data on changes in the innovation probably existed on the taped interviews but the IV-A rating itself gave no indication of the form in which the innovation was being used. For research which is designed to understand the factors which affect the rate of implementation, the adapation of an innovation, and discontinuation decisions, the LoU rating alone did not provide enough data.

Aggregating the LoU Data

A third research problem which resulted from use of the LoU was aggregation of data. The unit of analysis in the ten Wisconsin sites in the study was the I & R unit, a team of three to five teachers working together cooperatively. The I & R unit was considered to be the appropriate unit of analysis because we determined, with the help of IGE experts, that the I & R unit was the smallest discrete entity that could implement the innovation, the IPM.

Twice during the 1978-79 school year, we interviewed all the teachers in the ten units of focus using the LoU interview and we assigned each teacher an individual LoU rating. In order to analyze the quantitative data and run correlations between the variables, we needed to combine the individual scores and come up with a rating for each I & R unit. We encountered some problems when we tried to aggregate the data.

When all members of a unit had received identical individual LoU ratings, there did not seem to be a problem--the unit could be given the same rating as its individual members. For example, if each of the teachers of a unit received a IV-A rating, it seemed reasonable that the unit could be assigned a IV-A rating. But in 10 of the 20 instances in which aggregation was necessary, there was a discrepancy among the ratings of the individual teachers in the units.

The ten cases in which all unit members did not receive the same score uncovered a serious methodological problem for the work group: What procedure should be followed to assign a unit LoU rating? For example, at one school, in Administration 1, three teachers were assigned an LoU III rating in math while one received a IV-A. What, then, was the most appropriate LoU score for the unit in math? Several possibilities existed: One could adopt the "majority rules" philosophy and assign a Level III since three of the four received Level III ratings, or the score could be averaged, or one might argue "the chain is only as strong as the weakest link" and automatically assign the unit the lowest score obtained by an individual member (in this case, III). Alternately, one could argue that the highest rating received by any individual in the unit should be the unit rating because the unit's implementation of a program must be at least as advanced as that implemented by any of its individual members (in this case, Level IV-A).

Various arguments were made for and against the several possibilities. While the "majority rules" idea had a certain appeal because of its inherent simplicity and its seeming logic, it also appeared

very arbitrary to the work group and was, therefore, rejected. Averaging the scores was determined to be unsatisfactory, because a Level III.25 rating, for example, was meaningless. Discussion of the remaining two possibilities--assigning the lowest or highest individual score--led to an awareness that our knowledge of the instructional program in the ten sites went beyond the data collected in the LoU interview. Through observations and other discussions we had additional information which contributed to our forming a gestalt about the LoU of the units we knew best. Thus, it seemed that arbitrarily assigning the highest or lowest scores was inappropriate. We felt we needed to combine all of our data, from both the interviews and the observations, to arrive at a unit rating.

While we were trying to resolve the issue of aggregating the LoU data, several other issues emerged and, as a result, we decided not to aggregate the LoU data at this point in the project. This decision was based on two considerations: (a) there was not enough variance in LoU scores among teachers and schools to suggest that a correlational study was warranted at this time, and (b) the LoU data may not be the appropriate data to aggregate.

The second consideration prompted us to ask ourselves again: What are we really trying to do with the LoU? The answer we agreed on was that we were trying to document changes in the use of an innovation. We again recognized that documenting change required not only knowing how well an innovation was being implemented but also in what form the innovation was being implemented and for how much of the time. Thus, we came to believe that there are at least three dimensions which must be measured if one wishes to document change over time, and we began to formulate the concept of a Use Profile.

PART III

AN ALTERNATIVE APPROACH TO MEASURING THE USE OF AN INNOVATION

The Use Profile

The Use Profile evolved from an awareness by the work group that data generated from the LoU interviews alone was not sufficient for our research purposes. While we felt that the LoU adequately measured how well users were managing the innovation, it did not describe what form the implementation was taking and how often the innovation was in use. The research team believed that longitudinal data about the nature and score of use was necessary to document change over time. Thus, we conceived of three dimensions of the Use Profile--Complexity of Use (what is being done), Scope (how often it is being done), and LoU (how well is it being managed).

Complexity of Use

Complexity of Use evolved as a dimension of the Use Profile because we needed to specify what it meant to be a user in a specific school context. As noted earlier, the concept of complexity of use is not new. Hall and Loucks (1978) formulated the concept of innovation configuration earlier. And Cohen, Deal, Meyer, and Scott (1979) recognized various degrees of complexity in the instructional program of elementary schools. In order to test the hypothesis that more complex instructional technologies lead to more complex

classroom structures, Cohen et al. (1979) devised an index of instructional differentiation. Combined data from questions about the number of different sets of instructional materials, extent of student grouping, and extent of teacher choice in assigning materials yield a complexity index or score. The members of the Studies of Implementation work group intended to develop a complexity instrument which would produce a numerical score, i.e., a complexity index, which would reflect on the varying uses of the IPM.

Initial work on a complexity instrument was begun. Complexity was defined as the degree of differentiation of the instructional program. Operationally, complexity was defined by the elaboration of (a) student grouping, (b) staffing arrangements, (c) learning options, and (d) the classroom instructional management system. Contained in the four components of this operational definition were the five use criteria for the IPM: objective-based instruction, criteria-referenced pre- and postassessment, student grouping based on individual needs, and regrouping based on individual needs.

An instrument to measure complexity of use of the IPM was drafted. Based on field observations by the research staff and the data from the expanded LoU interviews, varying use options in the areas of student grouping, staffing arrangements, learning options, and the management system were generated. The intent was to pilot and revise the instrument and subsequently administer the questionnaire twice annually to each of the teachers in the ten I & R units in the study. Data from the complexity questionnaire were to generate a quantitative complexity score and to provide a qualitative narration of

subtle changes in use of the innovation. Since the Studies of Implementation project was terminated for funding reasons, the instrument has never gone beyond the draft stage.

Scope of Use

The second dimension to consider in documenting use of an innovation is Scope of Use. The scope of use refers to the amount of time devoted to the use of the innovation (the nature of use having already been determined by the complexity measure). Scope of use could be computed in two ways: (a) by figuring the percent of actual instructional time during which the innovation is used, and (b) by calculating the percent of curricular areas in which the IPM is being used. Scope of use would be reported as a percent.

Level of Use

The third dimension of the Use Profile should be the Levels of Use. The Levels of Use interview would be conducted according to its developers' format to obtain a measure of how well users report managing the innovation. The conventional scoring procedures prescribed by the developers of this valuable instrument would be used and the prescribed ratings assigned (Levels 0-VI).

The Use Profile, as we conceived it, would be the combined scores from the data collected from the three measures. In either quantitative or qualitative terms, a user could be described as implementing an innovation at a particular complexity level for a certain amount of time and at a particular "level of use." By using all three measures instead of only one, subtle changes in use of the

innovation could be noted more fully over time. For the focus of our research, this multidimensional data was considered necessary.

Conclusions

Our research was designed to provide insight into factors which affect: (a) decisions to adopt innovations, (b) the rate of implementation of innovations, (c) the adaptation of innovations, and (d) decisions to abandon or replace innovations. In order to obtain information about the effects of these factors, we believed it was necessary to document changes in the level of use of an innovation over time. The LoU instrument was selected as the measure for tracking changes in the use of an innovation.

Field experience in data collection quickly revealed that additional information besides that provided by the LoU was desirable for our research. Therefore, we supplemented the LoU interview to include questions about the specific use of the innovation (complexity of use or innovation configurations). Our specific research needs dictated collection of longitudinal data with respect to patterns of use as well as level of use.

Subsequent data analysis suggested yet a third type of data on innovation use--scope of use. Scope of use refers to the percent of instructional time or subject matter devoted to use of the innovation.

Combining the three measures of use--complexity of use, scope of use, and level of use--would produce a Use Profile which we believe would provide sufficient data for documenting changes in innovation use over time and provide a beginning understanding to the factors which affect the change process.

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APPENDIX A

(LoU Interview -- Form Provided by LoU Developers, Texas Training Program, July 1978)

LoU INTERVIEW

Are you currently using the _____

NO

Have you ever used it in the past? If so, when? Why did you stop? (if yes, go to *, then return).

O/I -- II — Have you made a decision to use _____ in the future?

I/II — If so, when will you begin use?

Knowledge — Can you describe _____ for me as you see it?

Acquiring Information — Are you currently looking for any information about _____? What kinds? For what purposes?

Knowledge — What do you see as the strengths and weaknesses of _____ in your situation?

Assessing — At this point in time, what kinds of questions are you asking about _____? Give examples if necessary.

Sharing — Do you ever talk with others and share information about _____? What do you share?

Planning — What are you planning with respect to _____? Can you tell me about any preparation or plans you have been making for the use of _____?

Final Question (Optional) — Can you summarize for me where you see yourself right now in relation to the use of _____?

PAST USERS*

Can you describe for me how you organized your use of _____, what problems you found, what its effects appeared to be on students?

When you assess _____ at this point in time, what do you see as the strengths and weaknesses?

7/20/78

YES

Open-Ended	Please describe for me how you use the_____. (Ask sufficient questions to get configurations.)
Assessing/ Knowledge	What do you see as the strengths and weaknesses of _____ in your situation? (Have you made any attempt to do anything about weaknesses? Probe those they mentioned specifically.)
Acquiring Information	Are you currently looking for any information about _____? What kind? For what purposes?
LoU V	Do you work with others in your use of_____? Have you made any changes in your use of _____ based on this coordination? (If yes, go to *.)
Sharing	Do you ever talk with others about _____? What do you tell them?
Assessing	(Have you considered any alternatives or different ways of doing things with the program?) Are you doing any evaluating, either formally or informally, that would affect your use of _____? Have you received any feedback from students that would affect the way you're using _____? What have you done with the information that you get?
III/IV-A/IV-B	Have you made any changes recently in how you use _____? What? Why? How recently? Are you considering making any changes?
Planning/ Status	Are you looking ahead to later this year, what plans do you have in relation to your use of _____?
Reporting III--IV-B/V	Are you working with others outside your team in your use of _____?
III--V/VI	Are you considering or planning to make major modifications to replace _____ at this time?

***LoU V PROBES**

1. How do you work together? What things do you share with each other?
2. How frequently?
3. What do you see as the effects of this collaboration?
4. Are you looking for any particular kind of information in relation to this collaboration?
5. Do you talk with others about your collaboration? If so, what do you share with them?
6. Have you done any formal or informal evaluation of how your collaboration is working?
7. What plans do you have for this effort in the future?

APPENDIX B

(Interview Form -- First Form Developed by the Studies of Implementation Work Group)

TO THE INTERVIEWER:

Has the interviewee signed a human subjects release form? YES____ NO____
(If no, give them one.)

Decide on a personal code number. It can be the last four social security digits, phone number, birthdate, anything they can remember to use again. Jot it here_____. Do not write their name on this!

Ask for permission to tape. Explain reasons.

Date of interview_____ School Code_____ Status Code_____

Begin Interview

In the IGE literature, we see lots of different terms and abbreviations which stand for complex ideas. One of those terms is the IPM. Are you familiar with the IPM?

○ If YES, proceed with LoU interview.

○ If NO, define the five criteria, then interview.

LoU INTERVIEW SCHEDULE

○ 1. Are you currently using the Instructional Programming Model (IPM) in reading (or math)?

YES NO (go to 25)

○ 2. Please describe for me how you use the IPM. (Probe for the five essential criteria.)

_____

_____

_____

○ 3. What do you see as the strengths of the IPM in your situation?

_____

_____

_____

4. And what do you see as the weaknesses of the IPM in your situation?

None or (go to 6) _____

_____

_____

5. What, if anything, have you attempted to do about these weaknesses?

_____

_____

_____

6. Are you currently looking for any information about the IPM?

YES ▼ NO (go to 7)

6a. What kind and for what purpose?

KIND	PURPOSE
_____	_____
_____	_____
_____	_____

7. Do you work with others, outside your unit, in your use of the IPM?

YES ▼ NO (go to 17)

8. Have you made any changes in your use of the IPM based on this coordination?

YES ▼ No (go to 17)

9. How do you work together?

_____

_____

_____

10. What things do you share with each other?

_____

_____

_____

11. How frequently do you work together and share?

_____ per _____

12. What do you see as the effects of this collaboration?

_____

_____

13. What, if any, particular kind of information are you looking for in relation to this collaboration?

Nothing or _____

_____

_____

14. Do you talk with others about your collaboration?

YES NO (go to 15)

14a. What do you share with them?

_____

_____

_____

15. Have you done any formal or informal evaluation of how your collaboration is working?

YES DON'T KNOW NO

16. What plans do you have for this effort in the future?

_____

_____

_____

17. Do you ever talk with others (inside or outside your unit) about the IPM?

YES NO (go to 18)

17a. What do you tell them?

_____

_____

_____

18. Have you considered any alternatives to the IPM or thought about different ways of doing reading (or math)?

YES NO

19. Are you doing any evaluating, either formally or informally, that would affect your use of the IPM?

YES NO

20. Have you received any feedback from students that would affect the way you are using the IPM?

YES NO (go to 21)

20a. What have you done with the information that you get?

_____

_____

_____

21. Have you made any changes recently in how you use the IPM?

YES NO (go to 22)

21a. What changes did you make? (Record below.)

CHANGES	WHY MADE (21b.)	HOW RECENTLY (21c.)

(For each change listed ask: 21b. Why did you make it?
21c. How recently did you make it?

22. Are you considering making any other changes?

YES NO

23. Looking ahead to later this year, what plans, if any, do you have in relation to your use of the IPM?

None or _____

_____

_____

24. Are you considering or planning to make major modifications to replace the IPM at this time?

YES NO

24a. Do you use the IPM in any other subject areas? YES NO

Which ones? TERMINATE

FOR THOSE NOT CURRENTLY USING IPM

25. How you ever used it in the past?

YES NO (go to 32)

26. When did you use it?_____

27. Why did you stop?_____

28. Can you describe for me how you organized your use of the IPM?

29. What problems did you find?

30. In your opinion, what effects did it appear to have on students?

31. At this point in time, as you assess the IPM, what do you see as its strengths?

32. And at this point in time, what do you see as its weaknesses?

NOT CURRENT USERS OR NEVER HAVE USED IPM

33. Have you made a decision to use the IPM in the future?

YES NO (go to 34)

33a. Where will you begin using it?

34. Please describe the IPM for me as you see it.

35. Are you currently looking for any information about the IPM?

YES NO (go to 36)

35a. What kinds and for what purpose?

KIND	PURPOSE

36. What do you see as the strengths of the IPM in your situation?

37. What do you see as the weaknesses of the IPM in your situation?

38. At this point in time, what particular questions are you asking about the IPM?

39. Do you ever talk with others and share information about the IPM?

YES — NO (go to 40)

39a. What do you share?_____

40. With respect to the IPM, will you tell me about any preparation or plans you have been making for using it?

41. Will you summarize where you see yourself, at the present time, in relation to the use of the IPM?

42. Do you use the IPM in any other subject areas?

YES — NO → TERMINATE

Which ones?_____

43. Please describe for me the subject in which you think you use the IPM in its most developed form.

44. What do you see as the strengths of the IPM in your situation?

45. And what do you see as the weaknesses of the IPM in your situation?

None (go to 47) or_____

46. What, if anything, have you attempted to do about these weaknesses?

_____

_____

_____

47. Are you currently looking for any information about the IPM?

YES NO (go to 48)

47a. What kind and for what purpose?

KIND	PURPOSE

48. Do you work with others, outside your unit, in your use of the IPM?

YES NO (go to 49)

49. Do you ever talk with others (inside or outside your unit) about the IPM?

YES NO (go to 50)

49a. What do you tell them?

_____

_____

_____

50. Have you considered any alternatives to the IPM or thought about different ways of doing_____?

YES NO

51. Are you doing any evaluating, either formally or informally, that would affect your use of the IPM?

YES NO

52. Have you received any feedback from students that would affect the way you are using the IPM?

YES NO (go to 53)

52a. What have you done with the information that you get?

_____

_____

_____

53. Have you made any changes recently in how you use the IPM?

YES NO (go to 54)

53a. What changes did you make? (Record below.)

CHANGES	WHY MADE (53a.)	HOW RECENTLY (53c.)

(For each change listed ask: 53b. Why did you make it?

53c. How recently did you make it?

54. Are you considering making any other changes?

YES NO

55. Looking ahead to later this year, what plans, if any, do you have in relation to your use of the IPM?

None or _____

_____

_____

56. Are you considering or planning to make major modifications to replace the IPM at this time?

YES NO

56a. Do you use the IPM in any other subject areas? YES NO

Which ones?

TERMINATE

APPENDIX C

(Interview Form -- Second Form Developed by the Studies of Implementation Work Group)

TO INTERVIEWER:

Has the interviewee signed a human subjects release form? YES___ NO___
(If no, give them one.)

Decide on a personal code number. It can be the last four social security digits, phone number, birthdate, anything they can remember to use again. Jot it here_____. Do not write their name on this!

Ask for permission to tape. Explain reasons.

Date of interview _____ School Code _____ Status Code____

BEGIN INTERVIEW

1. We want to talk to you about your _____ program. Would you please describe your _____ program. (Determine whether there are several different parts, e.g., basal, skills, etc. If there are several parts, run the interview focusing on one part then return to question two and ask about the other part(s).)

2. How many children do you have in your _____ program?

3. How many groups do you have in your _____ program?

4. How or what criteria were used to determine groups?

Criteria Categories

1. Learner behavior/characteristics.
   a. learning style
   b. motivation
   c. modes
2. I.Q.
3. Pretest information.
   a. standardized achievement test
   b. objective based (CRT) test
   c. past performance
   d. teacher judgment
   e. work sample/observation/P/P-test/performance test
4. Interest.
5. Age/grade level.

5. Who decided that you would have that number of groups?

(ME) ↓ (Go to Q. 8)

(THE UNIT or SOMEONE ELSE) ↓ (Go to Q. 6)

6. Do you break your _____ class down into subgroups?

7. How or what criteria were used to determine to form the subgroups?

8. How often do you change the groups? (Probe for unit decisions and individual decisions.)

9. What criteria do you use for regrouping children?

Criteria Categories

1. Learner behavior/characteristics.
   a. learning style
   b. motivation
   c. modes
2. I.Q.
3. Pretest information.
   a. standardized achievement test
   b. objective based (CRT) test
   c. past performance
   d. teacher judgment
   e. work sample/observation/P/P-test/performance test
4. Interest.
5. Age/grade level.

10. Are there different ways children can learn the same objective?

(YES) (Go to Q. 11) (NO) (Go to Q. 12)

11. About how many different ways do you usually have for children to learn an objective?

12. Tell me about these different way(s).

13. Who else is involved, besides you, in working with the children in your _____ grou

14. What do you see as the strengths in your _____ program?

15. What do you see as the weaknesses in your _____ program?

16. What, if anything, have you attempted to do about these weaknesses?

17. Do you work with others, outside your unit, with the _____ program?

(YES) (NO) (Go to Q. 26)

18. Have you made any changes in your _____ program as a result of this collaboration?

(YES) (Go to Q. 19) (NO) (Go to Q. 26)

19. How do you work together?

20. What things do you share with each other?

21. How frequently do you work together and share?

_____ per _____

22. What do you see as the effects of this collaboration?

23. Do you talk with others about your collaboration?

(YES) (NO)

24. Have you done any formal or informal evaluation of how your collaboration is working?

(YES) (Don't Know) (NO)

25. What plans do you have for this effort in the future?

26. Do you ever talk with others (inside or outside your unit) about your _____ program?

(YES) (NO)

26a. What do you tell them?

27. Have you considered any alternatives or different ways of doing _____?

(YES) (NO)

28. Are you doing any evaluating, either formally or informally, that would affect your _____ program?

(YES) (NO)

29. Have you received any feedback from students that would affect your _____ program?

(YES) (NO)

29a. What have you done with the information that you get?

30. Have you made any changes recently in your _____ program?

(YES) (NO)

30a. What changes did you make? (Record below.)

CHANGES	WHY MADE (30b.)	HOW RECENTLY (30c.)
_____	_____	_____
_____	_____	_____
_____	_____	_____

31. Are you considering making any other changes?

(YES) (NO)

32. Looking ahead to later this year, what plans, if any, do you have in relation to your _____ program?

33. Are you considering or planning to make your major modifications to your _____ program?

(YES) (NO)

34. Do you group children in any other subject areas? (YES) (NO)

Which ones?

(To interviewer: If their _____ program has more than one part, go back to question number 2 and do the interview again with the other part.)

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